

REMARKS

Claims 1-19 and 27-29 were pending in the above-identified application when examined. Claim 27 was withdrawn from consideration as being directed to a non-elected species. Claim 27 is canceled.

Claims 1 and 14 were objected to for containing informalities. In response, Applicants are amending claim 1 as suggested by the Examiner to replace "image" with --images-- in line 2 of claim 1. Claim 3 is amended to insert the missing word --comprises--. In view of the above amendments, Applicants request reconsideration and withdrawal of the objection to claims 1 and 14.

Claims 1, 5-10, 14, 16-19, 28, and 29 were rejected under 35 U.S.C. § 102(b) as anticipated by the article, "Automatic Reconstructions of 3D Objects using a Mobile Monoscopic Camera," IEEE Proceedings of the International Conference on Recent Advances in 3-D Digital Imaging and Modeling, (1997), hereinafter Niem. Claim 8 is canceled as being redundant in view of the amendment to claim 1. Applicants respectfully traverse the rejection of claims 1, 5-7, 9, 10, 14, 16-19, 28, and 29.

Independent claim 1 distinguishes over Niem at least by reciting, "analyzing a plurality of images of an object on a background that contains a plurality of separated marks, wherein for each image, analyzing comprises: analyzing the image to identify one of the marks that in the image is separated from the object; [and] identifying locations of a plurality of calibration points on the mark identified." Niem fails to disclose or suggest using a background containing separated marks.

Niem describes a 3-D reconstruction process that uses images of an object on a rotationally symmetric calibration pattern that surrounds the object. See, for example, Fig. 1 of Niem. As further described by Niem, use of a continuous surrounding calibration pattern generally requires extraction of calibration pattern from the overlapping silhouette of the object.

In accordance with an aspect of Applicants' invention, a background for an object can include separated marks that each provide enough calibration points for camera modeling. An advantage of using separated marks is that at least one mark is likely to be separated from the silhouette of the object being modeled. The separation simplifies identification of the mark in

the image. The separation also simplifies accurate determination of the locations of calibration points on the identified mark. Niem fails to suggest the use of a background containing separated marks or the resulting advantages. Accordingly, claim 1 is patentable over Niem.

Claims 5-7, 9, 10, and 14 depend from claim 1 and are patentable over Niem for at least the same reasons that claim 1 is patentable over Niem.

Independent claim 16 distinguishes over Niem at least by reciting, “transforming three-dimensional coordinates of a set of points in a candidate volume to the two-dimensional coordinates of a first of the images; and identifying an approximate volume of the object as containing the points that the transform maps onto the silhouette of the object in the first of the images.” Niem fails to disclose or suggest shape reconstruction using transformations from three-dimensional coordinates to two-dimensional coordinates.

Niem in section 4.1, starting on page 177, describes shape reconstruction using the method of occluding contours. For Niem’s method, each image is used to define a pyramid having a silhouette as a base and a camera focal point as an apex. The intersection of multiple pyramids in 3-D space provides an approximate bounding volume. Niem fails to disclose or suggest “transforming three-dimensional coordinates of a set of points in a candidate volume to the two-dimensional coordinates ... and identifying an approximate volume of the object as containing the points that the transform maps onto the silhouette of the object in the first of the images.” Accordingly, claim 16 is patentable over Niem.

Claims 17-19 depend from claim 16 and are patentable over Niem for at least the same reasons that claim 16 is patentable over Niem.

Independent claim 28 distinguishes over “an extraction unit capable of processing an image of an object on a background containing a plurality of marks that are separated from each other, wherein the processing includes identifying one of the marks that is separated from the object in the image, extracting a silhouette of the object, and determining locations of calibration points on the mark identified.” As noted above, Niem fails to disclose or suggest using separated marks or identifying a mark that in an image appears separated from an object. Accordingly, claim 28 is patentable over Niem.

Claim 29 depends from claim 18 and is patentable over Niem for at least the same reasons that claim 28 is patentable over Niem.

For the above reasons, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102.

Claims 2-4, 11-13, and 15 were rejected under 35 U.S.C. § 103(a) as unpatentable over Niem. Applicants respectfully traverse the rejection.

Claims 2-4, 11-13, and 15 depend from claim 1 and are patentable over Niem for at least the reasons given above to show that claim 1 is patentable over Niem.

Claims 2-4 further distinguish over Niem by reciting shapes in the marks. Such shapes have the non-obvious advantages of being separable while individually providing simple identification of calibration points for camera modeling. See for example, paragraphs [0033] and [0034] of Applicants' specification.

For the above reasons, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103.

Claims 30-39 are added. Claims 30-33 depend from claim 28 and are patentable for at least the same reasons that claim 28 is patentable. Claim 34 depends from claim 1 and is patentable for at least the same reasons that claim 1 is patentable. Claims 35-39 depend from claim 16 and are patentable for at least the same reasons that claim 16 is patentable.

In summary, claims 1-19 and 27-29 were pending in the application. This response cancels claims 8 and 27, amends claims 1, 14, 16, and 28, and adds claims 30-39. For the above reasons, Applicants respectfully request allowance of the application including claims 1-7, 9-19 and 28-39.

Please contact the undersigned attorney at (408) 927-6700 if there are any questions concerning the application or this document.

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Respectfully submitted,



David Millers
Reg. No. 37,396

THE PATENT LAW OFFICES
OF DAVID MILLERS
6560 ASHFIELD COURT
SAN JOSE, CA 95120
PH: (408) 927-6700
FX: (408) 927-6701